Recyclable, antibacterial isoporous through-hole membrane air filters with hydrothermally grown ZnO nanorods

최용호, 김문주, 이지아, 변재철, 강달영†
연세대학교
(dykhang@yonsei.ac.kr†)

Re-usable multifunctional air filters with good air filtration and antibacterial activity have been demonstrated based on hydrothermally grown ZnO nanorods (NRs). The thermoset based isoporous throughole membranes with excellent thermal stability have enabled simultaneously control of porosity and ZnO seed formation via high temperature annealing (~375°C). Following hydrothermal growth has led to densely populated ZnO NRs on both membrane surface and pore sidewall. Thanks to the nanofibrous shape of the grown ZnO NRs on pore sidewall, the membrane filters have shown high (>97%) filtration efficiency for PM2.5 with rather low (<100Pa) pressure drop. Double membranes with a separation gap of 15mm have shown an efficiency of up to 97.8% with a pressure drop of less than 100 Pa (94 Pa). The membrane filters can easily be cleaned by spraying them with water/ethanol mixture, making them reusable many times. In addition, ZnO NRs endowed the membrane with good antibacterial and photocatalytic properties to the membranes due to the wide band gap semiconductor nature of them. Therefore, the reusable, multifunctional membranes can be used in various applications that need an effective air filtration with antibacterial and photocatalytic functionality.